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Habitat suitability model for *Lepus corsicanus* in Corsica (France), implications for its conservation

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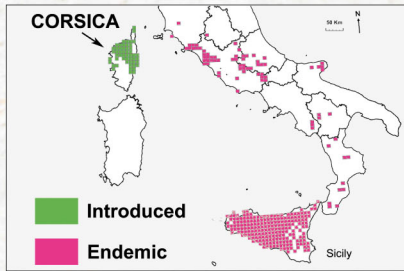


Figure 1 - Status of *L. corsicanus* in its current range²

INTRODUCTION

The Italian hare (*Lepus corsicanus*) was introduced into Corsica during the historical period for hunting purposes. A recent study¹ has shown its extensive presence in the northern part of the island and its scarcity in the south. In Italy, its land of origin, this species is listed as «Vulnerable» in the IUCN Red List. In Sicily the species is hunted and widely distributed with good population density, but on the mainland, with often fragmented and small populations, it is considered to be in regression and have a protected species status.

The objective of this work is to identify the species' potential distribution in Corsica in order to suggest appropriate management actions.



METHODS

We collected 484 confirmed observations of the species between 2002 and 2012 based on molecular or phenotypic criteria. Spatial filtering and projection on a 1x1 km UTM grid over the entirety of Corsica enabled us to define a sample of 170 species presence cells to build our model. The habitat in each cell was characterized through 18 land use/cover variables as well as aspect and altitude (Tab. 1).

Table 1 - Environmental variables used to describe the habitat

	altitude	as_east	as_north	as_nodtet	as_south	as_west
Meaning	Average altitude (m)	East aspect	North aspect	No or gentle slope (slope < 5°)	South aspect	West aspect
Meaning (CLC categories)	bl_forest	compl_cult	con_forest	fruit_tree	grassland	marsches
	Broad-leaved forest (311)	Complex cultivation Patterns (242)	Coniferous forest (312)	Fruit trees & Olive groves (222, 223)	Natural grasslands (321)	Marshes & Peat bogs (411, 412, 421, 422)
Meaning (CLC categories)	mix_forest	moors	ni_arable	pasture	prin_agric	rocks
	Mixed forest (313)	Moors & Heathland (322)	Non-irrigated land (211)	Pastures (231)	Land princ. occ. by agriculture (243)	Bare rocks (332)
Meaning (CLC categories)	sands	sclero-veg	spare-veg	urban	vineyard	woodschrub
	Beaches, dunes, sands (331)	Scleroph. vegetation (323, 334)	Sparsely veg. areas (333)	Urban or industrial areas (111 to 142)	Vineyards (221)	Transitional woodland-shrub (324)

We used the Maximum Entropy Model³ (MaxEnt v.3.3.3) to define the potential distribution area of the species on the island, with the following settings : automatic feature selection, a regularisation multiplier at unity, a maximum of 500 iterations, 10 replicates by cross-validation and a convergence threshold of 10⁻⁵. A map of the potential distribution of the species was constructed using the logistic output.

RESULTS AND DISCUSSION

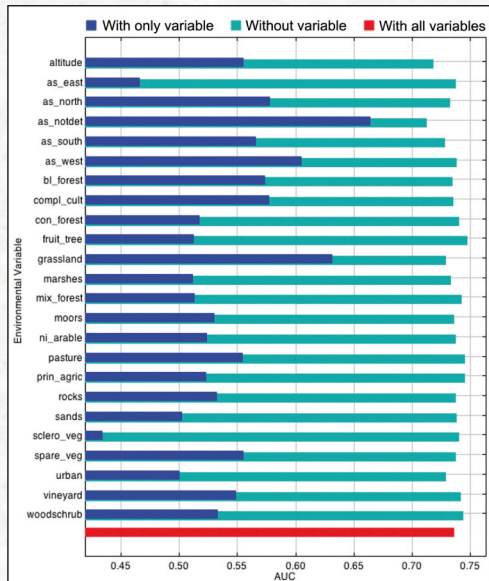


Figure 3 - Jackknife of AUC for *Lepus corsicanus*

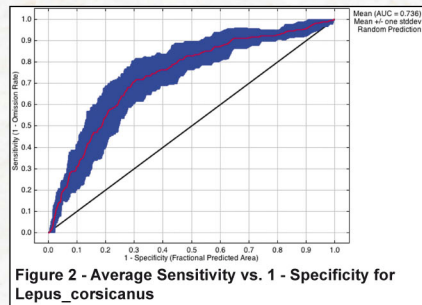


Figure 2 - Average Sensitivity vs. 1 - Specificity for *Lepus corsicanus*

The graph of Fig. 2 shows the receiver operating characteristic (ROC) curve, averaged over the replicate runs. The average test AUC for the replicate runs is 0.736, and the standard deviation is 0.050.

In Fig. 3 for each variable the dark coloured bar corresponds to models generated with only this variable. The light coloured bar corresponds to the generated models omitting the variable. The most important predictors were the presence of gentle or no slopes (<5°, as_nodtet) and the presence of grasslands. The absence of steep slopes is a characteristic of agricultural land but also of all the more anthropized areas.

The map (Fig.4) shows that the species currently occupies the major favourable areas of the island, mainly in the northern half. Less favourable zones however remain unoccupied and could still be utilized. These are mostly the areas South of Bastia (A), North of Ajaccio (B) and South of the island between Porto-Vecchio and Sartène (C).

- Zone A has already shown a natural colonization by the species since 2013.
- Zone B showed over 2002 and 2012 a particularly hybridized hare population due to the introduction of *L. europaeus* and *L. granatensis*, and where *L. corsicanus* represented only 37 % of analyzed specimens during this period.
- Zone C showed presence of hybrids as well, and specimens of *L. europaeus* and *L. granatensis*, though only over part of the zone.

CONCLUSION

- . Zone A: Natural colonization will undoubtedly be the best chance of progression of the species, although it would be helpful to introduce individuals originating from the main range.
- . Zones B and C: The future of the Italian hare will depend foremost on the future policy of hare populations management in Corse-du-Sud, where introduction of *L. europaeus* continues to have official support in 2017. The potential repopulation of these zones with *L. corsicanus* will indeed require not only that current introduction ceases, but also that no hare other than the Italian hare remain in the zones.

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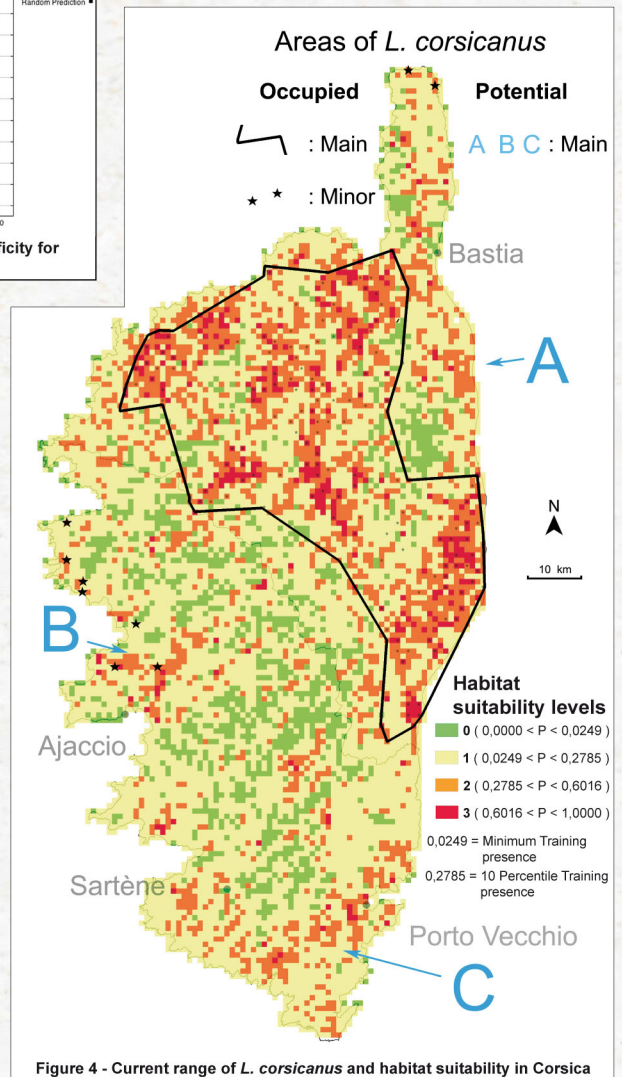


Figure 4 - Current range of *L. corsicanus* and habitat suitability in Corsica